Orcuttia inaequalis
(San Joaquin Valley Orcutt Grass)

5-Year Review:
Summary and Evaluation

Photo: E. Cypher, California Fish and Game, 2007

U.S. Fish and Wildlife Service
Sacramento Fish and Wildlife Field Office
Sacramento, California
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5-YEAR REVIEW
Orcuttia inaequalis
(San Joaquin Valley Orcutt Grass)

I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

Orcuttia inaequalis is a narrowly distributed annual of the grass family Poaceae, subfamily Chloridoideae, in the tribe Orcuttieae. *O. inaequalis* was presumed to be the only member of the Orcuttieae tribe that was endemic to the San Joaquin Valley (Stone et al. 1988), and is therefore commonly referred to as San Joaquin Valley Orcutt grass. With the exception of a single population in Solano County, the historical range of *O. inaequalis* is believed to be in the Southern Sierra Foothills Vernal Pool Region, which includes parts of Stanislaus, Merced, Madera, Fresno and Tulare Counties (Keeler-Wolf et al. 1998; Service 2005).

O. inaequalis is a highly specialized C_4 plant (an evolutionary adaptation that facilitates photosynthetic productivity in arid and semi-arid climates) that is dependent on deep vernal pools for survival. It requires inundated soils for at least part of the year for seed germination, seed bank storage, and its juvenile aquatic growth stage (Stone et al. 1988). Consequently, *O. inaequalis* seldom becomes established above the high water mark where Orcuttia species are competitively excluded (Keeley 1998), and forms distinct emergent ring-patterns below the high water mark (Stebbins et al. 1996). Plants emerge underwater, forming a basal rosette of juvenile leaves that are maintained for roughly three months (Keeley 1998). As the water temperatures increase, floating leaves form and remain until the standing water has evaporated, at which point terrestrial leaves are formed. Flowering begins within a few days after the pool has dried and typically peaks in mid-June, but may be extended into August or September depending on growth conditions (Griggs 1980). These growth phases, as well as C_4 photosynthetic anatomy, are adaptive features that promote the dominance of *O. inaequalis* in vernal pool environments for a month or more after the pools have dried (Keeley 1998).

Methodology used to complete the review

This review was conducted by staff in the U.S. Fish and Wildlife Service (Service), Sacramento Fish and Wildlife Office, Sacramento, California. The review is based on the following: information from species survey and monitoring reports, the *Recovery plan for vernal pool ecosystems of California and southern Oregon* (Service 2005) (Recovery Plan), documents generated as part of Sacramento Fish and Wildlife Office Endangered Species Act section 7 and section 10 consultations, journal articles and unpublished technical reports and grant proposals, discussions with species experts, and the Sacramento Fish and Wildlife Office species files. Primary sources of information used to update the species status and threats sections of this review included: the Recovery Plan, published articles, and personal communications and *in litteris* references from land managers and vernal pool experts.

Contact Information:

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Lead Field Office: Josh Hull, Recovery Division Chief, Sacramento Fish and Wildlife Office, (916) 414-6600.

Federal Register (FR) Notice Citation Announcing Initiation of This Review:

A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register on February 14, 2007 (72 FR 7064). No information from the public was received in response to the notice.

Listing history:

Original Listing
FR notice: 62 FR 14338
Date of final listing rule: March 26, 1997
Entity listed: *Orcuttia inaequalis*, a plant species.
Classification: Threatened
State Listing
San Joaquin Valley Orcutt Grass (*Orcuttia inaequalis*) was listed by the State of California as endangered in 1979.

Associated rulemakings: Critical habitat for this species was proposed on September 24, 2002 (67 FR 60033). The final rule to designate critical habitat for *Orcuttia inaequalis* was published on August 6, 2003 (68 FR 46684). A re-evaluation of non-economic exclusions from the August 2003 final designation was published on March 8, 2005 (70 FR 11140). An evaluation of economic exclusions from the August 2003 final designation was published on August 11, 2005 (70 FR 46924). Administrative revisions were published on February 10, 2006 designating 55,164 hectares (136,312 acres) of critical habitat (71 FR 7117). Clarifications on the economic and non-economic exclusions for the final designation of critical habitat were published on May

31, 2007, however, these clarifications did not change the areas previously designated as critical habitat. (72 FR 30279).

Review History: We have not conducted any status reviews for this species since the time of listing. Updated information on its status and threats was included in the 2005 Recovery Plan.

Species' Recovery Priority Number at start of review: The recovery priority is 8 (based on a 1 to 18 ranking system, where 1 is the highest recovery priority and 18 is the lowest) because the degree of threat is moderate, the recovery potential is high and *Orcuttia inaequalis* is a full species.

Recovery Plan or Outline

> **Name of plan**: Recovery plan for vernal pool ecosystems of California and southern Oregon.
> **Date issued:** December 15, 2005

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Endangered Species Act (Act) defines "species" as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition of species under the Act limits listing as distinct population segments to species of vertebrate fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species listing is not addressed further in this review.

Information on the Species and its Status

Species Biology and Life History

Orcuttia inaequalis is a narrowly distributed annual of the grass family Poaceae, subfamily Chloridoideae, in the tribe Orcuttieae. *O. inaequalis* was presumed to be the only member of the Orcuttieae tribe that was endemic to the San Joaquin Valley (Stone et al. 1988), and is therefore commonly referred to as San Joaquin Valley Orcutt grass. In consideration of the genus, Stone also mentions that assessment of the historical range of Orcuttieae species in the Central Valley is complicated by the fact that widespread agricultural development preceded study of these grasses. The historical range of *O. inaequalis* is believed to be the Southern Sierra Foothills Vernal Pool Region, which includes parts of Stanislaus, Merced, Madera, Fresno and Tulare Counties (Keeler-Wolf et al. 1998; Service 2005). Current status indicates that *O. inaequalis* has been extirpated from all Stanislaus County localities, and is present at only one of the two historical localities in Tulare County. In 2003 a new population was discovered in Solano County outside of the San Joaquin Valley and roughly 166 kilometers (103 miles) from the nearest known extant population. The current range of O. *inaequalis* includes portions of: Solano, Merced, Madera, Fresno, and Tulare Counties.

The California Natural Diversity Database (CNDDB 2012) includes information on 47 occurrences of *O. inaequalis*—12 extirpated, 4 possibly extirpated, and 31 presumed extant (see Appendix A and Figure 1). Based on surveys conducted in 2010 and 2011, Witham (2012) reported that the four occurrences considered 'possibly extirpated' by CNDDB were extirpated and one additional occurrence in Madera County was extirpated due to land conversion. The main concentration of extant occurrences is discontinuously distributed across an 80-kilometer (50-mile) range from east-central Merced County to the northern boundary of Fresno County. Outside of this concentration, there is one extant occurrence in central Solano County, and one in northern Tulare County. Across the historical range in the Southern Sierra Foothill Vernal Pool Region, *O. inaequalis* is confirmed to have been excluded from 17 sites largely due to the elimination of habitat (CNDDB 2012 and Witham 2012).

Abundance

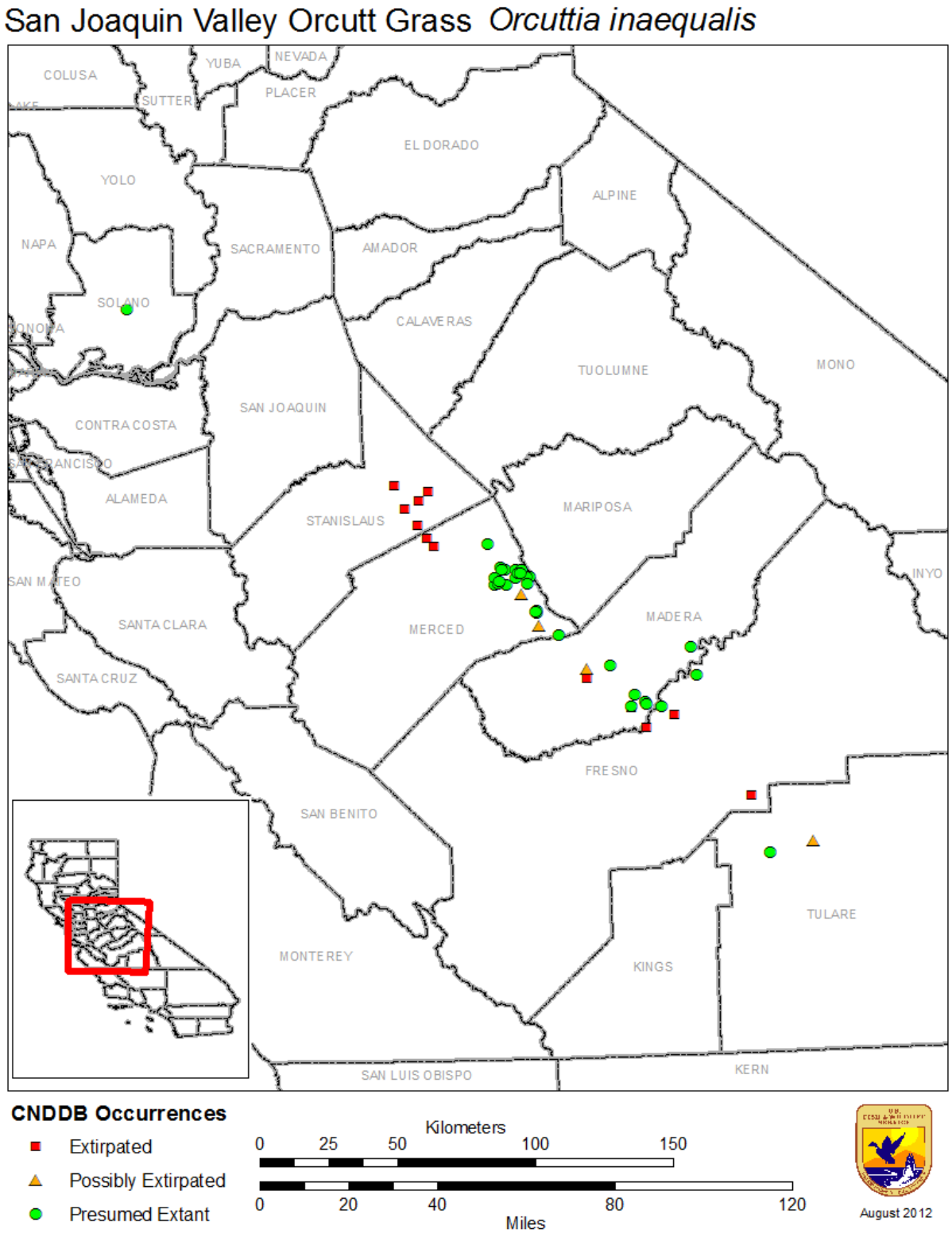
Vollmar (2002) reported that seed production by *O. inaequalis* is largely dependent upon annual precipitation and can vary two- to three-fold among years. Population estimates are further confounded by seed germination, which requires long periods of inundation and can vary considerably among years depending upon annual precipitation and associated water depth and duration in vernal pools. Thus, variability in annual precipitation affects the accuracy and predictability of population estimates and trends. Since listing, infrequent site visits and large inter-annual fluctuations in populations have prohibited the projection of population trends.

Habitat or Ecosystem

Typical land forms upon which *O. inaequalis* occurs include remnant alluvial fans and stream terraces (Stone et al. 1988) as well as tabletop lava flows (Stebbins et al. 1995). *O. inaequalis* is known to occur in acidic soils with textures ranging from clay to sandy loam. It has been documented on the Hideaway soil series on Fresno and Madera County tabletops, and Amador, Cometa, Corning, Greenfield, Los Robles, Madera Peters, Pollasky-Montpellier complex, Raynor, Redding and San Joaquin soil series throughout its range (Recovery Plan). Vollmar (2002) reported that *O. inaequalis* populations occur on Riverbank, North Merced Gravels, and Mehrten geologic surfaces, which could relate to the tendency of these surfaces to support larger pools, noting that soil characteristics may also play a role.

Vollmar (2002) termed *O. inaequalis* as a vernal pool "specialist" that has an affinity for large, deep vernal pools. Its occurrence is restricted to a narrow band of undulating topography at the base of the Sierra foothills, ranging from 30 to 755 meters (100 to 2475 feet) elevation above mean sea level (Stebbins et al. 1995). Stone et al. (1998) reported that *O. inaequalis* has been found in vernal pools ranging in size from 0.14 hectares (0.04 acre) to 4.9 hectares (12.11 acres). *O. inaequalis* has been associated with pools that exhibit pronounced soil surface cracking (Stebbins et al. 1996).

Figure 1 – Known CNDDB Occurrences of *Orcuttia inaequalis*



The current status of many presumed extant populations has not been reassessed, and areas that may support the species remain to be surveyed. Thus, reliable estimates of the amount and distribution of suitable habitat is currently unknown.

Changes in Taxonomic Classification or Nomenclature

There have been no changes to the taxonomy or nomenclature of *O. inaequalis* since listing in 1997.

Genetics

From phylogenetic analysis, Keeley (1998) reported that the absence of a ligule—the membranous tooth- or hair-like projection between the leaf sheath and blade common to many grass taxa—separated *Orcuttia* and *Tuctoria* into sister groups of *Neostapfia*. *Orcuttia* species can be also separated from *Tuctoria* by the presence of certain aquatic features, including the presence of floating leaves.

Rice and Emery (2003) reported that the relatively isolated character of vernal pool habitats likely restricts gene flow between species populations. Similarly, Griggs (1980) stated that gene flow between populations of *O. inaequalis* is likely non-existent. Thus, fertilization is typically restricted to individuals within a given pool and out-crossing among pools is infrequent. Nonetheless, Griggs (1980) reported that high genetic diversity exists even among *O. inaequalis* plants grown from the same seed collection source.

One reproductive quality observed in *Orcuttia* species that promotes high genetic variation among successive generations is the flowering pattern. *O. inaequalis* is wind-pollinated (Griggs and Jain 1983), and generally flowers from April to September (Vollmar 2002). The first two flowers on plants of these species open simultaneously and do not produce pollen until the ovaries are no longer receptive. Thus, fertilization for these flowers is solely a result of outcrossing from different plants.

Species-specific Research and/or Grant-supported Activities

Carol Witham conducted status surveys for *O. inaequalis* in 2010 and 2011 under a grant through the Central Valley Project Improvement Act (CVPIA) and published draft results in November 2012.

Five-Factor Analysis

The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

The 1997 listing rule described *O. inaequalis* habitat as having been reduced and fragmented throughout its historical range (Service 1997) and the Recovery Plan lists habitat loss and fragmentation as the largest threat to survival and recovery of this species. Primary causes

attributed to the reduction and fragmentation of habitat includes: agricultural land conversion, urbanization, hydrologic modifications, and small population size. According to Stone *et al.* (1988), all historical populations that existed in Stanislaus County and 12 historical localities from Madera and Fresno Counties had been extirpated by 1986-1987 due to habitat modification.

Urbanization and agricultural land conversion:
The vast majority of land on the Central Valley floor has potential for urbanization and agricultural conversion due to flat topography and its vicinity to existing infrastructure. As previously described, *O. inaequalis* occurs under a variety of edaphic and geologic conditions. Each habitat type—lower and upper stream terrace, remnant alluvial fan, or tabletop lava flow—exhibits various potential for land conversion. All 13 sites located on lower terrace soils had been extirpated before listing, presumably because these soil types are relatively fertile and therefore more suitable to intensive agriculture (Stone *et al*. 1988). These occurrences include five in Stanislaus County, four in Madera County, three in Merced County, and one in Fresno County. Four other localities had also been eliminated prior to listing, through indirect links to agricultural conversion. These include hydrologic modifications, which likely eliminated two occurrences in Merced County and one in Fresno County (Stone *et al*. 1988), and irrigated runoff which likely caused the elimination of one occurrence in Madera County (Service 2005).

Between 1997 (species listing) and 2005, approximately 36,068 acres (7.7% of mapped extent) of vernal pool habitat was converted to urban or agricultural land uses within the current range of the species (Holland 2009). The majority of this land conversion (28,613 acres) occurred within Merced and Madera Counties where 27 of the 31 extant CNDDB occurrences occur (Holland 2009 and CNDDB 2012). Of these 27 occurrences, 13 are protected from development by conservation easements or other land controls. A total of 14 CNDDB occurrences throughout the species range are currently protected in some form leaving 17 without any protection from urbanization and agricultural land conversion.

Hydrologic modifications:
As summarized in the Recovery Plan, the life cycle of *O. inaequalis* is strongly linked to vernal pool hydrology. Seed germination, juvenile aquatic stage, reduced competition by upland and exotic species, timing of flowering, and seed production are determined by the timing and duration of the inundation period, as well as available soil moisture throughout the growing season. Thus any changes to the hydrologic regime of the pools and/or source areas (watersheds) that effectively alter the timing, depth, or period of pool inundation will likely affect the stability of *O. inaequalis* populations. Common human activities that may alter hydrologic regimes include: altering landscape topography through urbanization, land use conversion, flood control, stream channelization, gravel and aggregate mining; or changes to the water holding capacity of soils and substrate by surface compaction, deep plowing, or the addition of soil amendments.

Hydrologic modifications from human activities have both benefited and impacted *O. inaequalis* populations. Stone *et al*. (1988) stated that *O. inaequalis* may be benefited by increases in the depth of water or length of pool inundation period, as it is endemic to deep water pools. Vollmar (*in litt.* 2012) observed that the depth of water and the period of inundation in some vernal pools have increased as a result of road development and associated changes in topography. Conversely, the hydrologic regime for one population in a playa pool at the base of the spillway for Burns Creek dam in Merced County has been altered and is of marginal depth and inundation period to support the currently extant occurrence of *O. inaequalis*. Stone *et al*. (1988) reported

another population located adjacent to a railroad grade in Merced County had been extirpated due to hydrologic alterations—a likely result of changes in culvert size under the grade.

Improper Grazing Regimes

The effects of grazing on vernal pool plants are largely site-specific, and are dependent upon a variety of factors including frequency, intensity and timing (Stone *et al*. 1988). Direct effects of improper grazing regimes can include direct consumption, soil compaction and increased nutrient load from animal waste (Vollmar 2002).

While improperly timed grazing can negatively impact the plant and its habitat, research by Marty (2004 and 2005) indicates that livestock grazing plays an important role in maintaining species diversity in vernal pool grasslands through control of invasive species. Direct consumption of *O. inaequalis* by grazers in the winter and early spring may be limited, due to the fact that the majority of the plants have not emerged or are in the aquatic growth stage of the lifecycle. Nonetheless, impacts to *O. inaequalis* plants, as a result of improper grazing regimes, are still recognized as a threat to extant populations.

Appendix A provides a site-specific list of known threats to each presumed extant populations of *O. inaequalis*. Other threats across the range of this species include invasive plants, off-road vehicles, small population size, and climate change which are discussed under Factor E.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Overutilization for commercial, recreational, scientific, or educational purposes was not perceived as a threat at the time of listing and does not appear to be a threat at this time. No instances of overutilization have been reported since listing.

FACTOR C: Disease or Predation

Disease was not known to be a threat to this species at the time of listing and is still not known to be a threat at this time. Predation resulting from livestock grazing was addressed under Factor A.

The Recovery Plan included foraging during grasshopper outbreaks as a potential reason for decline of the species in certain areas. Although grasshoppers have been observed on *O. inaequalis* plants at two localities (see Appendix A), this species appears to be only slightly susceptible to grasshopper predation. This characteristic has been attributed to the viscid-aromatic (sticky, fragrant) exudate produced by *Orcuttia* species, which may act as an effective deterrent to grasshoppers (Stone *et al*. 1988).

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

The Federal Endangered Species Act of 1973, as amended (ESA): The primary Federal law that provides protection for *O. inaequalis* is the ESA. With regard to federally listed plant species, section 7(a)(2) requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of Federally

endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a state law or regulation or in the course of any violation of a state criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species.

An incidental take permit pursuant to section 10(a)(1)(B) of the ESA should be obtained if a Federal agency is not involved in a proposed project and federally listed animal species may be taken as part of the project. The Service may issue such a permit upon completion of a satisfactory habitat conservation plan for the listed species that would be taken by the project. Although ESA take prohibitions generally do not apply to plants, many habitat conservation plans prepared as part of permit requirements include listed plants as covered species, and thus provide an additional layer of regulatory protection. The PG&E San Joaquin Valley Operations and Maintenance Habitat Conservation Plan is the only conservation plan that covers *O. inaequalis*.

Federal Clean Water Act: Section 404 of the Clean Water Act may afford some protection to *O. inaequalis*. The U.S. Army Corps of Engineers (Corps) issues permits for the discharge of dredged or fill material into navigable waters of the United States. The Corps interprets "the waters of the United States" expansively to include not only traditional navigable waters, but also other defined waters that are adjacent or hydrologically connected to traditional navigable waters. Before issuing a Section 404 permit to a project applicant that may affect federally listed species, the Corps is required under section 7 of the Endangered Species Act to consult with the Service.

California Endangered Species Act (CESA) and Native Plant Protection Act (NPPA): The CESA (California Fish and Game Code, section 2080 *et seq.*) prohibits the unauthorized take of State-listed threatened or endangered species. The NPPA (Division 2, Chapter 10, section 1908) prohibits the unauthorized take of State-listed threatened or endangered plant species. The CESA requires State agencies to consult with the California Department of Fish and Game on activities that may affect a State-listed species and mitigate for any adverse impacts to the species or its habitat. Pursuant to CESA, it is unlawful to import or export, take, possess, purchase, or sell any species or part or product of any species listed as endangered or threatened. The State may authorize permits for scientific, educational, or management purposes, and to allow take that is incidental to otherwise lawful activities. *O. inaequalis* was listed as endangered under CESA in 1979.

With regard to prohibitions of unauthorized take under the NPPA, landowners are exempt from this prohibition for plants to be taken in the process of habitat modification. Where landowners have been notified by the State that a rare or endangered plant is growing on their land, the landowners are required to notify the California Department of Fish and Game 10 days in advance of changing land use in order to allow salvage of listed plants.

California Environmental Quality Act (CEQA): The CEQA requires review of any project that is undertaken, funded, or permitted by the State or a local governmental agency. If significant effects are identified, the lead agency has the option of requiring mitigation to reduce these

effects or to decide that overriding considerations make mitigation infeasible (CEQA section 21002). Protection of listed species through CEQA is, therefore, dependent upon the discretion of the lead agency involved.

The Service is not aware of any specific county or city ordinances or regulations that provide direct protection for the species.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

The final listing rule (Service 1997) described threats to *O. inaequalis* from competition with invasive plants (discussed below) and soil disturbance associated with cattle grazing (Factor A). Other threats not discussed for this species in the final listing include off-road vehicles, small population size, and climate change.

Competition from invasive plant species:
Soil disturbance from overgrazing by cattle may adversely affect *O. inaequalis* indirectly by facilitating invasive plant species (Stone *et al*. 1988). Invasive species that have been reported to invade vernal pool habitat include *Hordeum geniculatum* (Mediterranean barley), *Phalaris paradoxa* (hood canarygrass), *Polypogon monspeliensis* (annual rabbitsfoot grass), *Lolium multiflorum* (Italian ryegrass), *Sida hederacea* (alkali mallow), and *Lepidium latifolium* (perennial pepperweed) (Stone *et al*. 1988 and Recovery Plan).

Off-road vehicles:
O. inaequalis occurrences on private lands may be threatened by off-road vehicle use. In addition, the repeated vehicle use of undeveloped roads and trails in vernal pool source areas results in compacted surface soils which can affect pool hydrology. According to CNDDB (2012), damage from off-road vehicle use is listed as a threat to two *O. inaequalis* occurrences (see Appendix A).

Small population size:
As described previously, annual precipitation affects both seed production and seed germination. Therefore the number of individuals that make up a given population of *O. inaequalis* can vary widely from year to year. In fact, some extant localities do not appear during dry years and appear the next year, under more favorable rainfall conditions, with plants numbering in the thousands (Stone *et al*. 1988). Conservation biology literature commonly notes the vulnerability of taxa known from small populations. In particular, small population size makes it difficult for this species to persist while sustaining the impacts from competition from non-native plant species, intensive grazing, drought, and other unknown factors. Such populations may be highly susceptible to extirpation due to chance events, inbreeding depression, or additional environmental disturbance (Gilpin and Soule 1988; Goodman 1987). Populations that decline to zero individuals may not always be capable of rebounding from the soil seed bank and the population may become extirpated (Service 2005). Small population size is noted as a concern for CNDDB occurrence numbers 48, 50, 53 and 62.

Climate change:
Pyke (2004) reported that climate change and reduced frequency of suitable habitat might represent the greatest threat to vernal pool species. Climate change scenarios for California predict changes in the hydrologic regime of many California landscapes (Cayan *et al*. 2005, Field

et al. 1999) including Central Valley vernal pools (Pyke 2004). Even modest changes in warming have been predicted to result in a reduction of the spring snowpack, earlier snowmelt, greater winter runoff and flooding, and reduced spring-summer runoff, as well as less available soil moisture in the summer (Cayan *et al.* 2005, Field *et al*. 1999). However, while current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005), predictions of climatic conditions for smaller sub-regions such as California remain uncertain. It is unknown at this time if climate change in California will result in a warmer trend with localized drying, more intense precipitation events, or other effects. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to particular species at this time.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been met. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management; assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

General recovery criteria for *O. inaequalis* and 19 other listed plants and animals are described in the Recovery Plan. This recovery plan uses an ecosystem-level approach because many of the listed species and species of concern addressed in the plan co-occur in the same natural ecosystem and share the same threats. The over-arching recovery strategy for *O. inaequalis* is habitat protection and management. The five key elements that make up this ecosystem-level recovery and conservation strategy are: (1) habitat protection; (2) adaptive management, restoration, and monitoring; (3) status surveys; (4) research; and (5) participation and outreach.

The Recovery Plan provides recovery criteria that either directly or implicitly address four of the five listing factors noted in the final rule to list the species and discussed above in the Five-Factor Analysis section: destruction, modification, or curtailment of habitat or range (Factor A), disease or predation (Factor C), inadequacy of existing regulatory mechanisms (Factor D), and other man-made or natural factors affecting its continued existence (Factor E). Overutilization for commercial, recreational, scientific, or educational purposes (Factor B) was not addressed in the Recovery Plan, as it was not considered relevant to the species.

<u>1: Habitat protection</u>: Accomplish habitat protection that promotes vernal pool ecosystem function sufficient to contribute to population viability of the covered species (Factor A).

1A. Suitable vernal pool habitat within each prioritized core area for the species is protected.

Core areas support high concentrations of federally-listed vernal pool species, are representative of a given species range, and are generally where recovery actions are focused. Core areas encompass the majority of extant occurrences, some of which may effectively act as source populations of vernal pool species for larger metapopulations. Core areas are not species-specific, rather more than one federally listed vernal pool species may be found within a given core area. All core recovery areas for *O. inaequalis* considered in the Recovery Plan were located within the Southern Sierra Foothills vernal pool region (Keeler-Wolf *et al.* 1998). The Recovery Plan lists four core areas that contain *O. inaequalis*: (1) Fresno; (2) Madera; (3) Table Mountain; and (4) Tulare. In addition, the Recovery Plan recommends protection of any rediscovered or newly discovered occurrences. It is notable that two newly discovered *O. inaequalis* localities were documented but not assessed within the Recovery Plan. One was discovered in 2003, in the Jepson Prairie Core Area, Solano County; the other was discovered in 2001 on the Chance Ranch in Merced County.

Core areas are ranked as Recovery Zone 1, 2, or 3 in order of their overall priority for recovery. As a recovery criterion, the Recovery Plan identifies specific percentages of suitable habitat to be protected in each of the four core areas. Where possible, the Recovery Plan recommends that protection occur in a manner that provides diverse vernal pool habitats in large habitat blocks and encompass local watersheds. Accordingly, habitat blocks should be inclusive of unoccupied pools within vernal pool complexes, as well as appropriate upland buffers around and between vernal pool complexes. Protection should also be effectively managed to maintain hydrologic function and prevent domination by invasive species.

Madera and Table Mountain core areas are categorized within Zone 1, whereas Fresno and Tulare core areas are included within Zone 2. No core areas containing *O. inaequalis* are ranked as Zone 3.

Two delisting criteria for *O. inaequalis* were recommended by the Recovery Plan: (1) that 95 percent of Zone 1 and 85 percent of Zone 2 suitable species habitat be protected; and (2) that 90 percent of known occurrences be protected. It is unknown if the first criterion has been achieved. The amount of existing suitable habitat across the range has not been determined and the Service does not currently have sufficient information to quantify either the acreage of suitable habitat within each core area or the acreage of protected suitable habitat for *O. inaequalis*. The second criterion has not been achieved. Only 45% (14 of 31) of the known extant occurrences are currently under conservation easements or land owner restrictions providing on site protection.

1B. Species localities distributed across the species geographic range and genetic range are protected. Protection of extreme edges of populations protects the genetic differences that occur there.

This criterion has been partially met. The distribution of historic (extirpated and possibly extirpated) and current (presumed extant) *O. inaequalis* occurrences are displayed in Figure 1. Over time, the distribution of known localities has been reduced to Solano, Merced, Madera, Fresno, and Tulare Counties. Appendix A lists these localities by ownership and protection status. In total, 14 localities have been protected or are proposed for protection through conservation easements or fee title transfer to public land agencies; 17 known occurrences either do not have any formal protection or the protection status remains unknown.

The Solano County occurrence observed on the Muzzy Ranch in 2003 represents a geographically unique population, as well as the extreme northern edge of extant populations. It is approximately 73 miles outside of the historical range for *O. inaequalis*, and approximately 103 miles northwest from the nearest extant population. The area containing the Muzzy Ranch occurrence is protected as part of the Muzzy Ranch Conservation Bank.

Tulare County represents both the historic and current southern extreme of the *O. inaequalis*. This county contains only two occurrences. One of these occurrences is considered extirpated (CNDDB 2012). The other occurrence is within the CDFG administered Stone Corral Ecological Reserve. Although this occurrence is on a State Ecological Reserve, threats by land use changes in adjacent privately owned land could compromise the hydrology of the inhabited vernal pool.

The second-largest reported occurrence of *O. inaequalis*—the Table Mountain occurrence on the Drayer Conservation Bank in Fresno County—was discovered in 1987 and is edaphically unique (influenced primarily by the soil rather than climate). In addition, this site could comprise a unique genotype (based on genetic composition) and phenotype (based on morphological appearance) of *O. inaequalis*. While most *O. inaequalis* occurrences are found in pools formed by riverine terrace processes, this rocky vernal pool complex is located on volcanic table lands at relatively high elevation (approximately 564 meters (1,850 feet), on shallow, extremely stony, moderately to strongly acidic residual soils of the Hideaway series. This pool is partially administered by the Bureau of Land Management (BLM), and by a privately operated ranch (Service 2005).

1C. Reintroduction and introductions must be carried out and meet success criteria.

The Recovery Plan recommends reintroducing *O. inaequalis* to vernal pool regions and soil types from which status surveys indicate the species has been extirpated; 100 percent of all introductions (and reintroductions) should be protected. The Service is aware of a single introduction of *O. inaequalis*. In 1993, the California Department of Transportation (CalTrans) sponsored the creation of 17 artificial vernal pools near the Madera Equalizing Reservoir, Madera County. This project was conducted to investigate the potential to use vernal pool creation as a mitigation measure for the

proposed Highway 41 expansion project. Durgarian (1995) confirmed the emergence and flowering of *O. inaequalis* in eight pools in 1993, seven pools in 1994, and eight pools in 1995. Stebbins *et al*. (1996) noted a general increase in *O. inaequalis* individuals and relative cover over the span of the four-year study. California Department of Fish and Game personnel (E. Cypher, CDFG, in *litt*. 2012) confirmed the presence of *O. inaequalis* at one of these pools in June 2005. The project is managed by the Madera Irrigation District on land owned by the Bureau of Reclamation.

Reintroductions need to be planned and implemented in formerly occupied areas of Stanislaus, Merced, Madera, and Fresno Counties. Additionally, the Recovery Plan explicitly states that one introduction of *O. inaequalis* should occur in Fresno County, on the Los Robles clay loam soil type to replace the loss of an occurrence northeast of Fresno, near East Mustang Avenue. These reintroductions have not yet occurred; therefore success criteria have not been achieved.

1D. Additional localities that are detected (and determined essential to recovery goals) are permanently protected.

This recovery criterion has been met. At this time, the Service is aware of two additional localities that were not considered in the Recovery Plan (Service 2005). These include the Muzzy Ranch occurrence in Solano County and the Chance Ranch occurrence in Merced County. The Solano County occurrence is protected as part of the Muzzy Ranch Conservation Bank. The endowment and conservation easement, held by the Center for Natural Lands Management, were established for the protection of the California tiger salamander and vernal pool ecosystem preservation. The Chance Ranch population was protected as part of the UC Merced Conservation Strategy with a conservation easement in favor of The Nature Conservancy.

1E. Habitat protection results in protection of hydrology essential to vernal pool ecosystem function, and monitoring indicates that hydrology that contributes to population viability has been maintained through at least one multi-year period that includes above average, average, and below average local rainfall as defined above, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

This criterion has not been met. Hydrologic monitoring has not occurred at any of the known extant occurrences; therefore the Service is unable to determine whether the hydrologic character and connectivity at extant sites is sufficient to support *O. inaequalis* over time.

2: Adaptive Habitat Management and Monitoring (Factors A, D, and E)

2A. Habitat management and monitoring plans have been developed and implemented within five years of individual parcel/property/area protection that facilitate maintenance of vernal pool ecosystem function and population viability by including provisions for managing nonnative and native competitors, appropriate grazing, fire or other management regimes, adaptive habitat management,

incorporation of new information resulting from implementation of research actions and addressing site-specific threats.

This criterion has been partially met. To date, information regarding the management of areas containing *O. inaequalis* remains incomplete, especially for those occurrences on privately owned land.

One *O. inaequalis* occurrence is located on the Stone Corral Ecological Reserve, administered by CDFG. This area is managed for species preservation and includes an endowment and management plan. The management plan includes cattle grazing to reduce residual dry matter and decrease competition by invasive species.

CalTrans acquired a parcel of land for the proposed Highway 41 expansion project; however, since the acquisition the expansion project was redesigned around this parcel and vernal pools on this parcel were restored in order to be used as mitigation for CalTrans projects. *O. inaequalis* has been documented in three vernal pools on the site (Vollmar, *in litt.* 2012). Currently, CalTrans and CDFG are in the process of transferring ownership of this land from CalTrans to CDFG. Once transferred, the land will be managed by CDFG for vernal pool species including *O. inaequalis*.

2B. Mechanisms are in place to provide for management in perpetuity and long-term monitoring of 1A-E, as previously discussed (funding, personnel, etc).

This criterion has been partially met. Existing conservation easements cover 11 localities in eastern Merced County. Though management plans and endowments have not been designated, conservation easements exist for the four occurrences on the Flying M Ranch and one occurrence on the Chance Ranch held by The Nature Conservancy. A conservation easement and a management endowment exists for the three occurrences on Virginia Smith Trust lands, part of the proposed Campus Vernal Pool Reserve, owned by the University of California, Merced (UC Merced). A management plan for the Reserve is currently being developed, with a draft management plan having been developed by the Sierra Nevada Research Institute in 2009 (UC Merced 2009). Three occurrences located on the Ichord Ranch are protected by a conservation easement and endowment through the California Rangeland Trust.

2C. Monitoring indicates that ecosystem function has been maintained in the areas protected under 1A-D for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

Monitoring of ecosystem function has not occurred for any of the known occurrences of this species. Therefore, the Service is unable to determine if the ecosystem function has been sufficiently maintained at extant locations to sustain viable populations across variable hydrologic regimes.

2D. Seed banking actions have been completed for species that would require it as insurance against risk of stochastic extirpations or that will require reintroductions or introductions to contribute to meeting recovery criteria.

This criterion has not been met. The Service knows of no active seed collection for *O. inaequalis* projects currently permitted, and is not aware of any collections in botanical gardens.

3. Status Surveys (Factors A, D, and E):

3A. Status surveys, 5-year status reviews, and population monitoring show populations within each vernal pool region where the species occur are viable (e.g., evidence of reproduction and recruitment) and have been maintained (stable or increasing) for at least one multi-year period that includes above average, average, and below average local rainfall, a multi-year drought, and a minimum of 5 years of post-drought monitoring.

To date, this criterion has not been met. Annual monitoring has not occurred during a time period that meets the requirements specified in the Recovery Plan. Annual surveys for this species do not occur at any of the known localities for this species. Since development of the Recovery Plan (Service 2005) informal site visits confirming the presence of this species have been conducted at some of the known occurrences. However, due to the lack of standardized survey protocol and variation in survey effort, these site visits provided various levels of information for each occurrence (see Appendix A).

Vernal pool region working groups will be important for tracking the progress of recovery efforts, including monitoring the status and trends of this species, particularly on private lands that are not currently monitored.

3B. Status surveys, status reviews, and habitat monitoring show that threats identified during and since the listing process have been ameliorated or eliminated. Site-specific threats identified through standardized site assessments and habitat management planning also must be ameliorated or eliminated.

Systematic habitat monitoring has not occurred at any of the known *O. inaequalis* occurrences during, or since the listing process (see 3A, above). Threats to this species described in the 1997 listing rule are still present, including impacts from urbanization, agricultural land conversion, hydrologic modifications, highway development, competition from invasive plant species, and improper grazing regimes. Other threats include off-road vehicles, small population size, and climate change. The Service does not have information indicating that these threats have been ameliorated or eliminated.

4. Research (All Factors):

4A. Research actions necessary for recovery and conservation of the covered species have been identified (these are research actions that have not been specifically

identified in the recovery actions but for which a process to develop them has been identified). Research actions (both specifically identified in the recovery actions and determined through the process) on species biology and ecology, habitat management and restoration, and methods to eliminate or ameliorate threats have been completed and incorporated into habitat protection, habitat management and monitoring, and species monitoring plans, and refinement of recovery criteria and actions.

Currently, this criterion has not been initiated. The Recovery Plan discusses a variety of research that would be beneficial to help refine recovery actions and criteria, and guide overall recovery and long-term conservation efforts (Service 2005, pages IV-53 to IV-63). The Recovery Plan recommends research on genetics, taxonomy, biology of vernal pool species, the effects of habitat management practices on vernal pool species and their habitat, and threats to vernal pool species and ecosystems.

4B. Research on genetic structure has been completed (for species where necessary for reintroduction and introduction, seed banking) and results incorporated into habitat protection plans to ensure that within and among population genetic variation is fully representative by populations protected in the Habitat Protection section of this document, described previously in sections 1A-E.

See 4A, above.

4C. Research necessary to determine appropriate parameters to measure population viability for each species have been completed.

See 4A, above.

5. Public Participation and outreach (All Factors):

5A. Recovery Implementation Team is established and functioning to oversee rangewide recovery efforts.

The Recovery Plan discusses a variety of participation programs to achieve the goal of recovery of the listed species in the plan. An essential component of this collaborative approach is the formation of a single recovery implementation team overseeing the formation and function of multiple working groups formed at the scale of the vernal pool region. The Vernal Pool Implementation Team was established in 2009 and meets quarterly. This criterion has been met.

5B. Vernal pool regional working groups are established and functioning to oversee regional recovery efforts.

This criterion has not been met for *O. inaequalis*. Currently, there is one regional working group covering Butte and Tehama Counties in California.

5C. Participation plans for each vernal pool region have been completed and implemented.

This criterion has not been met.

5D. Vernal pool regional working groups have developed and implemented outreach and incentive programs that develop partnerships contributing to achieving recovery criteria 1-4.

This criterion has not been met.

IV. SYNTHESIS

The final listing rule (Service 1997) reported that the principal threat to *O. inaequalis* at the time of listing was the conversion of habitat to agriculture and urban uses. As a secondary threat, the final listing document described that hydrologic modifications—such as changes associated with agricultural land conversion (irrigated agricultural runoff) and changes in the timing, duration, and depth of vernal pool inundation—likely induced further loss of *O. inaequalis* populations. These threats and others noted since the time of listing continue to present a challenge for the preservation and conservation of *O. inaequalis*. Other threats to *O. inaequalis* include improper grazing regimes, competition from invasive plant species, off-road vehicles, small population size, and climate change.

Across the contemporary range, 14 of 31 (45%) extant *O. inaequalis* localities are currently protected or proposed for protection. Direct impacts from the threat of land conversion or urbanization are currently, or have potential to be, excluded from these localities. Conversely, 17 extant occurrences have no known protection at this time, and therefore continue to be vulnerable to the threats previously described (see Appendix A). Moreover, the potential effects of climate change could threaten the stability of all localities for this highly specialized species that is dependent upon a specific set of environmental conditions.

Currently, many of the recovery criteria (Service 2005) for *O. inaequalis* have not been achieved, and in some instances, have not been initiated. Some areas of potentially suitable habitat have not been surveyed, and protection of known occurrences has not occurred across an adequate percentage of the priority recovery zones. Status level surveys of known occurrences have not been completed across all known localities. Reintroductions have not occurred in areas where *O. inaequalis* has been extirpated. In addition, research, monitoring, management and public outreach have not occurred to a large degree since the development of the Recovery Plan. Based on continuing threats to several occurrences, we conclude that *O. inaequalis* should remain categorized as a Federally threatened species under the Act. No status change is warranted at this time.

V. RESULTS

Recommended Listing Action:
____ Downlist to Threatened
____ Uplist to Endangered
____ Delist (indicate reason for delisting according to 50 CFR 424.11):
    ____ *Extinction*
    ____ *Recovery*
    ____ *Original data for classification in error*
___X__ No Change

New Recovery Priority Number and Brief Rationale: No change recommended.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

The Recovery Plan recommends research on genetics, taxonomy, biology of vernal pool species, the effects of habitat management practices on vernal pool species and their habitat, and threats to vernal pool species and ecosystems. The following recommendations have been identified, based on communication with land managers and species experts, as well as through the process of reviewing literature and the status of existing records.

Recovery: Preserve additional, known extant occurrences to reach recovery goals outlined in the 2005 Recovery Plan. Preservation of large blocks of vernal pool habitat that contain complete or large portions of vernal pool complexes is needed to ensure the phenotypic and genotypic variation exhibited by this species is protected. The Service should also work with private landowners for the conservation of habitat for *O. inaequalis* populations through conservation easements or other methods.

Research: Conduct coordinated research for *O. inaequalis* on various topics including: 1) suitable habitat surveys within the historical range of the species, 2) annual population stability and trend monitoring of all known extant locations, and 3) the design and implementation of reintroduction experiments. Genetic research should also be conducted to refine our understanding of genetic diversity within and among extant populations, and should be correlated with existing and anticipated (based on climate change models) environmental conditions. To date this type of research has only assessed genetic material from a small number of sites (Griggs 1980). Without better understanding of the population dynamics of the species, we do not know the extent to which protected lands provide self-sustaining populations of this species within each vernal pool region. Lastly, to date only one vernal pool creation project which incorporated *O. inaequalis* has been conducted. Since 1993, *O. inaequalis* populations have been confirmed at these creation sites. This experiment appears to be a successful method by which overall species stability on San Joaquin Valley landscapes could be augmented, and *O. inaequalis* populations expanded.

Monitoring: Develop and implement a standardized formal monitoring program that collects data in sufficient detail to evaluate species status and examine changes in population dynamics and community composition. Monitoring should be conducted in areas with known occurrences throughout the range of this species, including revisiting historical survey sites. Suitable habitat surveys need to be completed such that we have a clear understanding of the distribution of *O.*

inaequalis populations. Monitoring of annual trends and stability needs to assess short- and long-term fluctuations of individual localities which would assist in anticipating demographic changes in response to climate change over time. Stone *et al*. (1998) recommended research focused on assessing the range of inundation conditions necessary to maintain *O. inaequalis*.

Habitat-related research: Assess the long-term effects on the hydrology of vernal pools from urbanization and agricultural-related alterations to vernal pool sub-watersheds. Efforts should lead to determinations of appropriate hydrology (or upland) buffers.

Habitat-related monitoring: Develop management indicators for identifying potential problems and assessing ecosystem health as it pertains to vernal pool species and establish requirements for appropriate management of vernal pool landscapes. Because of urban encroachment and resulting hydrological changes, conservation efforts should be focused on retaining natural surface and subsurface watersheds and on managing for unseasonable sources of water that infiltrate to vernal pool preserves both of which result in changed site hydrology.

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APPENDIX A

SITE-SPECIFIC LIST OF KNOWN OWNERSHIP, PROTECTION STATUS, AND THREATS TO EACH EXTANT *O. INAEQUALIS* POPULATION

Appendix A - Site-specific list of known ownership, protection status, and threats to each **extant** *O. inaequalis* populations. Stone *et al.* 1988; CNDDB 2012; J. Vollmar, *in litt.* 2012 and C. Witham *in litt.* 2010, Witham 2012).

Occurrence Number	Core Recovery Area	Ownership	Protection Status	Threat	Comments
4	Merced	UC Merced	Campus Vernal Pool Reserve	Threat not identified.	
5	Merced	UC Merced	Campus Vernal Pool Reserve	Threat not identified.	
6	Merced	Private	Unknown	Threat not identified.	
26	Merced	Private (TNC)	TNC, Flying M Ranch Easement	Threat not identified.	*>10,000 plants observed by Witham in 2010.*
28	Merced	Private (TNC)	TNC, Flying M Ranch Easement	Threat not identified.	*Approximately 2 million plants observed in primary playa in 2010. No plants observed in surrounding smaller pools.*
33	Merced	Private	Unknown	Evidence of grasshopper damage was noted in 1986.	*~10,000 plants observed in one pool in 2010.*
34	Merced	Private (TNC)	TNC, Flying M Ranch Easement	Threat not identified.	
35	Merced	Unknown	Unknown	Overgrazing. Exotic weed (*Sida* sp.) competition.	Playa pool at base of spillway for Burns Creek Dam, and is of marginal depth and inundation period.
38	Merced	Private	Unknown	Overgrazing	Less than 1,000 plants observed in 1981.
39	Merced	Private	Unknown	Overgrazing	
41	Madera	Private	Unknown	Overgrazing, agriculture, subdivision development.	*Overgrazing not noted in 2010, but habitat marginal for this species. 65 plants observed in one pool.*
43	Madera	CalTrans	Transfer of parcel ownership to CDFG in process.	Overgrazing, development and highway expansion	*Several pools on the west side of the road are suffering from lack of*

Occurrence Number	Core Recovery Area	Ownership	Protection Status	Threat	Comments
					vegetation management.
45	Madera	Private	Unknown	Site was plowed and planted to wheat in 1986, but *O. inaequalis* was abundant at site in 1991. Other threats include off-road vehicle use, hydrologic changes from the adjacent canal and surrounding agriculture.	*800 plants observed in two pools in 2010. Witham (2012) noted site disturbance (discing) in 2011 and considers the occurrence Possibly Extirpated.*
46	Merced	Private	Unknown		
47	Fresno	BLM-Hollister Resource Area, Private	half of pool on public land; half on private grazed land.	At least two populations at this site, smaller population is on land administered by BLM and is fenced, larger population is subject to overgrazing and off-road vehicle use.	Table Mountain vernal pool complex.
48	Madera	Private	Unknown	Small population size, overgrazing, land conversion	
49	Merced	U.C. Merced	Campus Vernal Pool Reserve	Threat not identified.	
50	Merced	Private	Unknown	Small population size; overgrazing; Population threatened by non-native species.	
51	Merced	Private	Unknown	Overgrazing	
53	Fresno	Private	Unknown	Small population size; urban development.	
54	Madera	Bureau of Reclamation	Federally owned land, Managed by Madera Irrigation District	5 of 6 pools fenced to exclude grazing; grasshoppers observed grazing on plants in 1995.	Six extant populations verified in 1996 (Stebbins et al., 1996).
55	Madera	Private	Kennedy Table Mt. Mitigation Bank	Threat not identified.	
56	Tulare	CDFG	Stone Corral Ecological Reserve	Threat not identified.	Located at margin of CDFG administered land. ~1,000 plants observed in 2011 (Witham 2012).
57	Merced	Private	Ichord Ranch, Conservation Easement	Threat not identified.	
58	Merced	Private	Unknown	Overgrazing.	>5,000 plants observed in 2011 (Witham 2012).

Occurrence Number	Core Recovery Area	Ownership	Protection Status	Threat	Comments
59	Merced	Private (TNC)	TNC, Flying M Ranch Easement	Overgrazing.	
60	Merced	Private	Ichord Ranch, Conservation Easement	Overgrazing, and hydrologic modifications from undeveloped dirt road establishment.	
61	Merced	Private	Ichord Ranch, Conservation Easement	Overgrazing, and hydrologic modifications from undeveloped dirt road establishment.	
62	Merced	Private	Unknown	Small population size; overgrazing.	
63	Solano	Private	Unknown	Overgrazing.	
64	Merced	Private	UC Merced, Chance Ranch Easement held by TNC	Threat not identified.	

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

San Joaquin Valley Orcutt Grass (*Orcuttia inaequalis*)

Current Classification: Threatened

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
_X_ No change needed

Review Conducted By: Justin Sloan, Senior Biologist, Sacramento Fish and Wildlife Office

Date Submitted to Region 8: _____

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve Cay C. Monde Date 8/7/2013